The use of acidifiers to alleviate ascites in poultry

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Despite investigation of the ascites syndrome for many years, it is still a condition that inflicts financial loss on poultry farmers around the world.

It is estimated that of the 40 billion broilers produced annually around the world, 5% of these as well as 20% of roaster birds die of ascites.

The incidence of ascites has been increasing in recent years.

According to an annual survey in the UK, broiler producers reported 88 and 130 million death cases due to ascites in 2005 and 2006 respectively.

The cost to the broiler industry of ascites related condemnation of chicken carcasses at processing reached US $2.25 million dollars in 2003.

The cost to the worldwide broiler chicken industry due to ascites related mortality has been estimated to be in excess of US $500 billion per year.

The question is: How can ascites be minimised?

Traditionally, genetics have been blamed for ascites in bird flocks, however, breeding companies have improved genetic resistance of stock to this syndrome.

In reality, a considerable number of ascites occurrences are triggered by microbial factors (E. coli, salmonella, aspergillus) coupled with contributing environmental and nutritional factors.

Acidifiers have gained considerable attention in modern animal production as an efficient alternative to antibiotics.

Dietary acidification with organic acids has been shown to contribute to environmental hygiene by preventing feed and water from microbial and fungal deterioration.

Moreover, dietary supplementation with acidifiers decreases the occurrence of pathogenic bacteria in the gastrointestinal tract thus improving animals’ growth performance and health status.

It is also proven that acidifiers successfully fight against the gastrointestinal pathogens, like salmonella, E. coli and campylobacter. With promising results in the alleviation of ascites in broilers, the application of acidifiers can be further expanded.

Pathology

The ascites syndrome in broiler flocks has been increasing at an alarming rate, and this condition has become one of the leading causes of mortality and whole carcase condemnations throughout the world.

Ascites represents a spectrum of physiological and metabolic changes leading to the excess accumulation of fluid in the abdominal cavity.

These changes occur in response to a number of dietary, environmental and genetic factors.

Improvements in growth performance and decreases in mortality rates, as well as benefits in alleviating ascites have been observed in recent trials with Biomin’s acidifier product Biotronic SE.

Definition

The term ‘ascites’ actually refers to the fluid accumulation in the abdominal cavity (or so called ‘waterbelly’). The disease is more scientifically known as pulmonary hypertension syndrome.

Ascites is most commonly diagnosed at four to five weeks of age. Total mortality due to ascites is higher in the male parent lines, which have the capability of faster growth and higher muscle deposition compared to the female lines.

Ascites in poultry

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Pathology

The pathology is associated with abnormally high blood pressure between the heart and lungs (pulmonary hypertension) leading to heart failure, increased blood pressure in
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the veins and excessive build-up of fluid in the liver which leaks into the body cavity. Characteristic symptoms include:
- Poor bird development.
- Dilated abdomen (‘waterbelly’).
- Dyspnoea (panting, accompanied with gurgling sounds, even in the absence of apparent heat stress).
- Possible cyanosis (a blue discolouration of the skin, especially around the comb and wattles and muscle tissue).

Aetiology

The aetiology of ascites is very conflicting. Usually genetics have been blamed for the ascites. However, breeding companies have improved genetic resistance of stock to ascites.

The combination of environmental (ambient temperatures, high altitudes, stock density, air quality), nutritional (diet density, feeding type), hygienic (feed, environmental hygiene) and genetic events lead to this metabolic disease.

A considerable number of ascites syndrome in broiler flocks is caused by microorganisms. Most of the Gram negative bacteria (E. coli, salmonella, campylobacter) are considered pathogenic because of their lipopolysaccharide (LPS) layer.

Some studies have shown that LPS triggers pulmonary vasconstriction leading to ascites (pulmonary hypertension) in broilers.

Airborne LPS is ubiquitous in the environment of broilers and is positively related to the amount of organic dust in poultry houses.

For example, respiratory exposure to E. coli can amplify the incidence of ascites five-fold in broilers. It is known that Salmonella typhimurium may cause up to 79% mortality in one week old chickens.

However, in some studies lesions of salmonellosis were reported for four to six week old broilers with E. coli co-infection consequentially leading to ascites.

Another pathogenic agent is the mould, Aspergillus fumigatus, which is occasionally present in the environment of all poultry.

Disease caused by this mould, so-called ‘brooder pneumonia’, forms mould colonies in the lungs, and produces hard nodular areas leading to air sac infection and subsequently to the development of ascites.

Treatment and prevention

Firstly, it is important to understand the underlying causes of an ascites occurrence on a poultry farm. In the case of ascites caused by genetics, feed restriction might reduce the effect of the disease.

Slower growing birds have reduced oxygen needs allowing the cardiopulmonary organs (heart and lungs) to keep up with oxygen demands of the birds.

However, reducing the feed intake of broilers decreases the growth performance. Feed restriction is only of economic benefit when the incidence of ascites is very severe.

In the case of ascites caused by microorganisms, recent studies investigating the effect of feed supplementation with acidifiers have shown promising results. Of course, optimal management practices are also very important for reducing the problem of ascites and maximising performance of broilers.

The effect of the acidifier Biotronic SE on ascites incidence was studied on a commercial broiler farm in Bolivia.

**Table 1. Effect of Biotronic SE on body weight and mortality rate in broilers.**

<table>
<thead>
<tr>
<th></th>
<th>Negative control group</th>
<th>Positive control group</th>
<th>Biotronic SE group</th>
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</thead>
<tbody>
<tr>
<td>Day 14</td>
<td>No. of chickens</td>
<td>300</td>
<td>299</td>
</tr>
<tr>
<td></td>
<td>Final bodyweight (g)</td>
<td>246.0</td>
<td>238.0</td>
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<tr>
<td></td>
<td>Mortality rate (%)</td>
<td>0.00</td>
<td>0.33</td>
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<td></td>
<td></td>
<td></td>
<td>0.33</td>
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<tr>
<td>Day 35</td>
<td>No. of chickens</td>
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<td>291</td>
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<tr>
<td></td>
<td>Final bodyweight (g)</td>
<td>1104.0</td>
<td>1301.0</td>
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<tr>
<td></td>
<td>Mortality rate (%)</td>
<td>2.04</td>
<td>3.09</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2.39</td>
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<td>Day 42</td>
<td>No. of chickens</td>
<td>279</td>
<td>285</td>
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<td></td>
<td>Final bodyweight (g)</td>
<td>1708.0</td>
<td>1805.0</td>
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<tr>
<td></td>
<td>Mortality rate (%)</td>
<td>7.53</td>
<td>5.26</td>
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<td></td>
<td></td>
<td></td>
<td>3.81</td>
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<tr>
<td>Day 46</td>
<td>No. of chickens</td>
<td>260</td>
<td>279</td>
</tr>
<tr>
<td></td>
<td>Final bodyweight (g)</td>
<td>1835.0</td>
<td>2019.0</td>
</tr>
<tr>
<td></td>
<td>Mortality rate (%)</td>
<td>15.39</td>
<td>7.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.76</td>
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</table>

For the initial 42 days, the broilers did not show any obvious clinical signs of ascites, even though on day 35 mortality rates were recorded in the negative control, positive control and Biotronic SE groups as 2.04, 3.09 and 2.39% respectively (Table 1). On day 42 an outbreak of ascites was observed on the broiler farm with typical ascetic symptoms such as gasping, cyanotic combs and wattles, excessive abdominal fluid accumulation and mortality rates.

The incidence of ascites was confirmed by post-mortem examination.

**Results and discussion**

For the initial 42 days, the broilers did not show any obvious clinical signs of ascites, even though on day 35 mortality rates were recorded in the negative control, positive control and Biotronic SE groups as 2.04, 3.09 and 2.39% respectively (Table 1). On day 42 an outbreak of ascites was observed on the broiler farm with typical ascetic symptoms such as gasping, cyanotic combs and wattles, depression, extended abdomens, and increased mortality rates up to 7.53, 5.26 and 3.81% in the negative control, positive control and Biotronic SE groups respectively.

In the Biotronic SE group, the mortality rate increased 37.27% over the mortality rate prior to the ascites outbreak, compared to 72.90 and 41.25% respectively in the negative control and positive control groups.

Necropsy of the dead birds revealed the characteristic lesions of ascites. Amber or clear fluid (lymph) was found in the abdominal cavity, hearts were enlarged with fluid in the pericardium (the sac surrounding the heart), livers were swollen and congested and sometimes with fibrin adhered to their...
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surface, and lungs were pale or grayish. By
the end of week seven the mortality in the
negative control and positive control groups
reached 15.39% and 7.53% respectively,
whereas the group fed diets supplemented
with Biotronic SE recorded the lowest mor-
tality rate at 6.76%.
This trial result demonstrated that diet
supplementation with the acidifier Biotronic
SE represents a solution to alleviate the
effect of ascites on broiler farms.
In this study, ascites could be attributed to
a microbial cause, most probably salmonella
or E. coli and some other co-infection
agents.
The genetic cause of ascites herein might
be excluded, since the growth of the broil-
ers was much lower compared with the
standard growth performance of the Cobb
500.
Due to poor hygienic conditions on the
farm, conditions for the proliferation of
pathogenic micro-organisms in the environ-
ment and feed were favourable.
Moreover, some predisposing factors such
as high altitude and insufficient ventilation
were present, exacerbating the ascites syn-
drome in this broiler flock.
Due to its antimicrobial effect, Biotronic
SE improved the environmental hygiene and
prevented the feed from microbial and fun-
gal deterioration.
In addition, dietary supplementation with
acidifiers is known to decrease the occur-
rence of pathogenic bacteria in the gastroin-
testinal tract thus improving the animals’
health status.
This was confirmed by the reduction of
mortality rates in the Biotronic SE group
compared with the negative control and
positive control (AGP) groups.
In this trial, the addition of Biotronic SE to
the feed was effective in alleviating the effect
of ascites caused by microbial factors in
broilers.
The Biotronic product line consists of
products available in both powder and liquid
forms for application in feed and water –
ideal and practical solutions for prevention
and control of ascites outbreaks in broiler
flocks.

Conclusion
In modern animal production acidifiers have
been proven to be an efficient alternative to
antibiotics. Dietary acidification contributes
to environmental hygiene, with a continued
function through either the feed or water
into the animals’ gastrointestinal tract.
Biotronic SE has been successful in allevi-
ing the effects of various intestinal diseases,
with its action against ascites in broilers the
latest application available to producers.

References
responses of broilers to bacterial lipopolysaccharide (LPS): Evaluation of LPS source and
dose and impact of pre-existing pulmonary hypertension and cellulose micro-particle selec-
tion. Poultry Science, 84: 432-441.
embryos of two broiler lines differing in susceptibility of ascites. British Poultry Science, 37:
1003-1013.
salmonellosis, colibacillosis, and histomoniasis in broiler flock fed with antibiotic free com-
mmercial feed. Avian Pathology, 29: 639-642.
animal houses. Journal of Veterinary Medicine, 47. 37-46.